The new matter is presented in a very lucid form, and from the instructions and detailed explanations, which are intended to lighten the work of the teacher, the average student should find little difficulty in working intelligently in the laboratory without much supervision.

In connection with the formulation of chemical changes, a brief reference is made to the theory of electrolytic dissociation, and the reader is informed that the reactions involved in analysis are, as a rule, ion reactions. If this is really the case, it is difficult to justify the author's use of ordinary chemical equations in preference to ionic equations, even if it be admitted, that, in some cases, the representation of oxidation and reduction changes is not quite so simple when the ions are taken into consideration.

In view of the undoubted merits which the book possesses, it is distinctly unfortunate that nearly two-thirds of the contents should be a mere copy of a previous and very recent publication. There is nothing in the titles of the two books to suggest such a large measure of identity in respect of text and diagrams to prospective purchasers, and it is to be regretted that the publishers should have seen fit to proceed to publication in this particular way. H. M. D.

MATHEMATICS AND OPHTHALMOLOGY.

The Prescribing of Spectacles. By A. S. Percival. Pp. vi+159. (Bristol: John Wright and Sons, Ltd.; London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd., 1910.) Price 5*s*. 6*d*. net.

DR. A. S. PERCIVAL is one of the most eminent of the comparatively few English ophthalmologists who have shown the requisite knowledge to treat mathematically in an exhaustive manner optical problems connected with the eye. The ordinary student of ophthalmology is content to accept on authority the results obtained by others, or at most to study such geometrical expositions as may be readily understood. Indeed, he is generally wholly incapable of comprehending an analytical proof, and nothing is so abhorrent to his mind as an algebraical formula. It is greatly to be deplored that more emphasis is not laid upon the acquirement of a good knowledge of physiological optics, a subject which necessarily forms the very foundation of ophthalmology. Moreover, by far the greater part of every ophthalmic surgeon's work consists in the correction of errors of refraction, of defects in muscle balance, and other problems of an essentially optical nature. Only those who have given assiduous attention to the mathematical conditions presented by these problems can appreciate the help which this arduously acquired knowledge gives them. It is a humiliating fact that many practising opticians are far better equipped in this respect than most ophthalmic surgeons, and if the latter seriously expect to hold their own against the encroachments of the former they must outrival them on their own ground.

Dr. Percival's little book will prove of valuable service in the task. All the common problems which daily confront the surgeon in ordering spectacles for errors of refraction and defects of muscle balance are discussed, and the underlying principles lucidly explained. In most cases mathematical proofs, culled from the author's work on optics and other original papers, are set forth. Dr. Percival's name is specially associated with the formulæ for periscopic glasses, and the inquiring student will here be enabled to find out how the formulæ were arrived at, and why such lenses are to be preferred. A few paragraphs, such as the pinhole test of ametropia, might have been omitted as of little practical value, and the student would do well to read Maddox's book on the "Ocular Muscles" in conjunction with the chapter devoted to the subject in this work. The author's advice is always founded on a secure scientific basis, and such paragraphs as the following show that he is not carried away by purely theoretical conceptions. In speaking of the association between accommodation and convergence he says:—

> "Clearly, if the relation between the two functions is unfitted for present requirements, and if there is no sufficient faculty of adaptation that can be brought into play by training, we should make the glasses suit the patient, instead of vainly attempting to make the patient suit the glasses."

And again:—

> "In conclusion, I would say that although few patients will require such a complete examination as is here suggested, yet it is well to investigate the relationship of these functions of convergence and accommodation whenever symptoms still persist after the correction of any refractive errors and hyperphoria that may exist."

We can cordially recommend the book, and we hope that it may stimulate many ophthalmic surgeons to acquire a more profound knowledge of this branch of their subject.

THE BEETLES OF INDIA.

The Fauna of British India, including Ceylon and Burma: Coleoptera Lamellicornia (Cetoniinae and Dynastinae). By G. J. Arrow. Pp. xiv+322+ii coloured plates, and 76 illustrations in the text. (London: Taylor and Francis, 1910.)

THE beetles of India are an enormous subject, and the volume before us only deals with two subfamilies of the great group Lamellicornia, the first of which, though comprising the well-known and extremely interesting rose-chafers, is only represented by a few species in Britain, while the Dynastinæ, though a few species are found in southern Europe, is not represented in the British fauna at all. Two hundred and eighty-seven species of these two subfamilies are here described as belonging to the Indian fauna, but the editor's estimate of these being "perhaps less than one-sixth of the great 'series' of Lamellicornia," is perhaps somewhat too high, when we consider that the Lamellicornia include the whole of the chafers, the sacred beetles, and the stag-beetles.

Mr. Arrow has been fortunate in receiving the cooperation of the curators of most of the principal entomological collections in Europe and India, and of many enthusiastic and experienced collectors in India and Ceylon, and his work may therefore be taken as a trustworthy epitome of what is at present

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known relating to his subject. The glossary of technical terms which follows the preface will be useful, and there is also a comprehensive introduction of upwards of thirty pages in which the structure is fully described, and clearly illustrated by diagrams. These are points which are frequently too much neglected by entomological authors, but which are of real practical importance. Besides general remarks and a section on structure, the introduction deals with larvæ, vocal organs, sexual dimorphism, food and habits, and classification. The Lamellicornia beetles are mostly vegetable feeders, or dung or carrion beetles, and some of them, like our own cockchafers, are very destructive to grass in the larval stage, and to leaves of trees when mature. Some, chiefly belonging to the groups described in the present volume, inhabit the nests of ants and termites in the larval stage, and are tended by these insects for the sake of their secretions, while the dung and carrion beetles are general scavengers.

The Lamellicornia, as their name implies, are distinguished by their short lamellated antennæ, which may be observed in a well-developed and characteristic form in our common cockchafers. Mr. Arrow recognises three main families, the Scarabæidæ, Passalidæ, and Lucanidæ. The Passalidæ are not European; the Lucanidæ are the stag-beetles. The Scarabæidæ are divided into two smaller divisions, the Pleurosticti, with four subfamilies represented in the Indian fauna, and the Laparosticti, with eight.

The general arrangement of the volume is similar to that adopted in previous volumes of the "Fauna of India," and need not be further commented on here. Eight species are represented on each of the coloured plates.

We congratulate Mr. Arrow on the completion of an excellent piece of work, and hope that entomologists may have reason to be grateful to him for a long series of equally excellent volumes.

W. F. K.

ELECTRIC MOTORS.

Electric Motors. Continuous, Polyphase, and Single-phase Motors: Their Theory and Construction. By Henry M. Hobart. Second edition, entirely re-written, revised, and enlarged. Pp. xxiv+748. (London: Whittaker and Co., 1910.) Price 18*s.* net.

THE first edition of this work appeared in 1904. Since then remarkable advances have been made in electrical engineering. A foremost place in this progress must be given to electric motors, and more especially to that class employing commutators, in connection with both single- and poly-phase alternating currents. Indeed, the electrification of railways has made the variable-speed single-phase motor with a good starting torque indispensable, for at present the single-phase system alone seems to fulfil the requirements of main line electric traction. Also the polyphase induction motor is no longer to retain the great disadvantage in the matter of speed regulation, which makes it inferior to the continuous-current shunt motor, for successful means are now known whereby the speed may be varied economically over a wide range.

Both these problems are discussed in the present edition, and form part of the new material contained therein, but we find the treatment is mainly descriptive and too general to be of much use to anyone seriously engaged in the design or manufacture of these machines. Admittedly the subject is a difficult one, at any rate, more difficult than the design of ordinary continuous-current and induction motors. Nevertheless, in a book on the theory and construction of electric motors room ought to be made for a proper scientific study of these recent developments.

Coming to the other and major part of the book dealing with more or less *standard* motors, we do not find much improvement on the first edition. To a scientific engineer the author's style is too roundabout, illogical, and non-mathematical. A German engineer would probably call it "unpedägogisch." For instance, the author treats the principles of design by means of examples. Surely the classical way of developing formulæ from the theory, followed by practical details, and illustrated by examples, is far better. Nor—to judge from his examples—does the author appear to have kept pace with the times. We can only think that many of the designs, both of continuous- and alternating-current motors, have long since been repudiated by their respective firms.

The methods of calculation advocated by the author are often open to objection, but to cite instances would take us too far, as the list before us is really too long to choose from. We think enough has been said, however, to show that, while appreciating the immense amount of information the writer has collected, we cannot agree he has produced a book which can be regarded as a standard treatise on the theory and construction of electric motors for the use of students or scientifically-trained engineers.

STANLEY P. SMITH.

THE GEOLOGY OF GERMANY.

(1) *Lehrbuch der Geologie von Deutschland. Eine Einführung in die erklärende Landschaftskunde für Lehrende und Lernende.* By Prof. J. Walther. Pp. xv+358. (Leipzig: Quelle and Meyer, 1910.) Price 7.60 marks.

(2) *Geologie von Deutschland und den angrenzenden Gebieten.* By Prof. R. Lepsius. Zweiter Teil, Lief. ii., Das nördliche und östliche Deutschland. Pp. vi+247–548. (Leipzig: W. Engelmann, 1910.) Price 10 marks.

(3) *Geologie von Ostpreussen.* By Prof. A. Tornquist. Pp. vii+231. (Berlin: Gebrüder Borntraeger, 1910.) Price 10 marks.

(1) PROF. WALTHER has been fortunately compelled to write an account of the geology of Germany, in furtherance of the scheme to which he stands committed. He is one of those educational leaders who believe that knowledge of literature and of cosmopolitan science is insufficient for the citizen. The Fatherland itself, *solum patriae*, must be understood in order to be loved. We must not begin and end with arranging minerals in cabinets and pointing

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